Is the Law of Reflux Valid? *

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In the classical monetary debates, the Banking School held that notes would be equally demand-elastic whether supplied by many or a single issuer. The Free Banking School held that notes would be less demand-elastic if supplied by a single issuer. These assertions have rarely, if ever, been subject to more stringent statistical testing. In this paper I compare the elastic properties of the note stock of the Swedish note banking system in 1880–1895 with those of the regime in 1904–1913, when the Bank of Sweden held a note monopoly. Evidence suggests that notes did not become less elastic after monopolisation, thus lending support to the views of the Banking School.

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1 Introduction

A big issue in the 19th century classical monetary debates was the question of the elasticity of the currency.[1] How should monetary institutions be arranged to make currency supply responsive to the "needs of trade", increasing and decreasing with changes in demand? In the most classical of the debates, the British one, three views emerged known as those of the Currency School, the Banking School and the Free Banking School. The Currency School denied that there was any need for an elastic currency, and it favoured quantitative restrictions on note supply to stop the banks from over-issuing. The Banking School held the opposite view, claiming that restrictions would be harmful since it would make the currency inelastic and unresponsive to needs. It would also be unnecessary, since note-issuing banks – whether many or a single one – could not issue beyond what the public was willing to hold. There was a "law of reflux" at work – unwanted notes would always be returned to the issuer, either deposited with it or used to repay loans. The note stock would therefore always be "demand-elastic", that is, supply would always conform to demand.[2] The law of reflux would be particularly effective, if the issuer adhered to the "real bills doctrine", and only discounted commodity bills – bills drawn in exchange for commodities – of short maturity.

The Free Banking School sided with the Banking School in holding that quantitative restrictions would be harmful to the "needs of trade". However, it argued that it was crucial that there be many

[1] On the 19th century monetary debates, see Smith (1936), White (1984), Glasner (1992), Selgin and White (1994a), Schwartz (1995). On the modern theoretical literature on free banking, see the survey article by Selgin and White (1994b), and references therein.

[2] In the following, the expression "demand-elasticity" is used in the sense of the monetary literature of the studied period, namely that note *supply* is responsive to changes in demand. It should thus not be confused with the idea that demand is elastic.

issuers, since notes would then be subject to the interbank clearing mechanism. Many issuers would speedily redeem each other's notes through the clearing. By contrast, notes of a single issuer would be treated as base money and would therefore not be redeemed: they would either be reissued or deposited with the issuer. In the latter case notes would continue as a demand liability and be part of the banks' reserves, which could trigger a credit expansion. Moreover, banks would have no incentives to repay loans if their borrowing rate (at the central bank) was below their lending rate – it would then be more profitable to re-issue the notes.

Hence, demand-elasticity required many issuers. Unrestricted discretion would enable banks to accommodate peak demands for currency and hence make note supply "upward elastic". Competition would ensure active redemption and hence make note supply "downward elastic". With a single issuer (a central bank) demand-elasticity would instead depend on the prudence of the central bank in its open market operations. Even if the central bank increased supply during peak demands, notes would not automatically be withdrawn through the clearing once demand subsided. Crucially, the speed of redemption would increase. Historically, a note circulated on average for 10 days in the Scottish free banking system, while a Bank of England note would circulate on average for 150 days (Agardh 1845, Gilbart 1834). Moreover, while in a competitive note banking system a note returned was a note redeemed, this was not so with a single issuer, since it could also be deposited and hence re-issued. For a single issuer, the "speed of reflux" would be greater than the "speed of redemption", wherefore notes would be upward elastic, but imperfectly downward elastic.

The debates of the classical monetary schools have received much scholarly attention. However, there seems to be few studies that quantitatively test the merits of the claims involved. In particular, there are virtually no studies of how different note regimes affect the elasticity of the currency. An exception is Selgin and White (1994), who show how elastic the note stock of the unrestricted Canadian note banking system was compared to the note stock of the American

National Banking system, in the late 19th century. A problem is that competitive note banking regimes often ended before systematic bank statistics were collected. This is the case of Britain where it ended already in 1845, which is probably the reason why the elasticity claims of the classical monetary schools have – to my knowledge –not been tested.[3]

For this reason, the case of Sweden should be of interest. In the late 19th century, about twenty-five commercial banks called Enskilda banks issued notes, competing with the Bank of Sweden, until this bank gained a note monopoly in 1901–1904. The case of Sweden is of interest for three reasons. First, data are readily available: all commercial banks were required to compile monthly balance statements to the Swedish Bank Supervisory Authority. Second, the Swedish experience of competitive note banking ended in the middle of the classical gold standard period 1870–1914, wherefore *ceteris paribus* conditions can be said to apply. Third, the Swedish system contained a peculiarity in the "return discount rate". Banks could rediscount bills with the Bank of Sweden at a rate half a percentage point lower than the official discount rate. Banks had therefore potential access to a "money machine" that should have impaired the efficiency of the law of reflux.[4] Moreover, the Bank of Sweden adhered to the real bills doctrine in its discount policy, in that it would "avoid loan and accommodation bills", and only discount bills with at most 45 days of maturity. All the classical doctrines of the Banking School – needs of trade, law of reflux, real bills – were thus represented in the Swedish case, and their effects can be quantitatively assessed.

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[3] With regard to free banking, there is a growing empirical literature. Dowd (1992) surveys 60 historical instances of free banking. Recent negative assessments of historical free banking performance (in Australia and Switzerland) are presented in Hickson and Turner (2002) and Neldner (2003). On free banking in Sweden, see Ögren (2003), and Lakomaa (2004).

[4] Brisman (1931, p. 218) claims that the return discount rate was unique to Sweden.

This paper investigates the relative merits of the claims of the Banking School and Free Banking School. Does the law of reflux work equally well with a single issuer, as it does with many? This is investigated by comparing the elastic properties of the note stock of the unrestricted note banking system in 1880–1895 with those in 1904–1913, when notes were supplied exclusively by the Bank of Sweden. Did the note stock become less elastic after monopolisation, and particularly, less downward so? If the Banking School was right, and the law of reflux is always effective, then there should be no difference in note elasticity before and after monopolisation. If on the other hand the Free Banking School was right, then the note stock should become less elastic after monopolisation.

1 Institutional background

This section briefly reviews the institutional framework relevant to the Swedish money and banking system in 1880–1913. In the latter half of the 19th century two types of institutes issued notes. *Enskilda banks* (Private banks) were commercial banks with unlimited liability. *The Bank of Sweden* was the bank of the parliament, which also acted as a commercial bank. Bank of Sweden notes were legal tender by the Swedish constitution of 1809. There were about 25 Enskilda banks, and they held a dominant position in the financial system. Their share of the note market was over 50 percent.

The Enskilda banks were regulated by the Bank Law of 1874. The law stated cash and capital requirements that were linked to the note-issuing rights.[5] Enskilda bank notes were to be redeemed only into gold coin (and not into Bank of Sweden notes).

[5] To issue notes, gold reserves had to be at least 10 percent of paid-in capital. Enskilda bank notes were to be redeemed only into gold coin. The volume of notes outstanding could not exceed the sum of the bank's holdings of: Collateral for capital; Claims up to fifty percent of paid-in capital; and Gold exceeding ten percent of paid-in capital.

The note-issuing rights of the Bank of Sweden were based on a "contingency system". The bank was allowed to issue notes equal to its reserves (specie + foreign exchange) plus a fixed "contingency". During the note competition period the contingency was highly stable: in 1880–1887 it was 35 million, and in 1888–1898 it was 45 million. With note monopolisation it rose steadily each year, particularly in the boom period of WWI.

The clearing function of the Swedish banking system was peculiar. In 1856 the Stockholms Enskilda Bank was started. It immediately began to act as a clearing bank for other note-issuing banks. However, the Skandinaviska Kreditaktiebolaget, a non-issuing bank, largely took over the clearing function in the 1860s, mainly because it offered better terms. There were thus two clearing banks in the period 1880–1901, one of which did not issue notes.

In 1897 a new bank law was promulgated that prescribed the monopolisation of notes by the Bank of Sweden. The transfer of the Enskilda banks' note stock to the Bank of Sweden occurred between January 1901 and January 1904. Clearing was now also taken over by the Bank of Sweden.

Monetary policy of the Bank of Sweden, 1880–1913

During the whole of the 19th century Sweden suffered from so called "transfer crises", that is, external drains in times of liquidity crises abroad. The traditional policy of the Bank of Sweden during these crises was known as the "strangle system". When an external drain occurred, the bank would contract it's lending, not raise interest rates – a policy that caused sharp fluctuations in the volume of credit. The policy was to have a fixed discount rate. From 1890, however, the strangle system was abandoned for a more modern discount rate policy, when the Bank of Sweden began to adjust the discount rate rather than lending volumes to cope with external drains. Also, foreign exchange rather than gold was used to clear debts.

According to Brisman (1931, p. 211), the Bank of Sweden held a position in the 1880s that was unique in the world. Whereas in most other countries the state bank had developed into a modern central bank – with a monopoly on notes, setting interest rates and acting as

a bankers' bank and a lender of last resort – the Bank of Sweden was still largely a commercial bank competing with other banks. It did not rediscount the bills of other banks. Mostly for commercial reasons (the Bank of Sweden could not compete with the Enskilda banks in the market for commercial loans), this policy was to change.

In 1878/1879 the Bank of Sweden began to rediscount bills and extend bond-secured loans to banks that did not issue notes. In 1893 the right to rediscount was extended to all banks. Commercial loans were from now on no longer extended. In 1897, after the promulgation of the new bank law prescribing monopolisation, rediscounting grew in importance. In 1901 the Bank of Sweden declared that it would rediscount all acceptable bills presented by the commercial banks. In September 1905 it declared that it would only rediscount bills with less than forty-five days of maturity. It would also "avoid accommodation and loan bills" (Simonsson 1931, p. 39). This was an adherence to the real bills doctrine, according to which a central bank should only discount bills drawn in exchange for commodities.

2 Note elasticity before and after monopolisation

The merits of the claims of the classical monetary schools are tested by formulating "conjectures" regarding the consequences of note monopolisation that are implicit in the doctrines of the Free Banking School, and confronting them with data.

2.1 Conjectures

The Free Banking School held that note supply should be more demand-elastic in an unrestricted note banking system, than in a central banking regime. Note monopolisation trades interbank clearing for central bank prudence. Due to "the information problem", clearing is more efficient than prudence.[6] The note stock might become upward inelastic if the central banker responds

[6] Selgin (1988, p. 89).

inadequately to increased currency demands.[7] Even more likely, the note stock might become less downward elastic. Because the speed of redemption would decrease, notes would linger in circulation after an expansion, unless the central banker prudently acts to withdraw the surplus notes. Even if notes are returned to the Bank of Sweden, they might become deposited rather than redeemed, and hence continue "in circulation" as a demand liability – call this *liability inelasticity*. In sum, free banking theory suggests that note monopolisation could have the following consequences:

1. The note stock might become less upward elastic.
2. The note stock might become less downward elastic.
3. The demand liabilities of the Bank of Sweden might become less elastic.

2.2 Measuring demand-elasticity

This paper intends to measure the demand-elasticity of the note stock. Obviously, greater monthly changes in the note stock does not necessarily reflect that it has become more demand-elastic. To measure the latter, knowledge of demand, a non-observable quantity, would be needed. An indirect way to measure demand-elasticity would be to look at interest rates. Miron (1986) measures call loan rates at the New York stock exchange in 1890–1928, and argues that their smaller post-WWI seasonal variation reflects that currency supply became more demand-elastic after the Federal Reserve system was founded. Likewise, Rich (1988) presents data on call loan rates in Montreal , showing that they fluctuated less than those in New York

[7] The most famous instance is perhaps the Federal Reserve System, whose failure to act as a lender of last resort in the face of increased currency demand, it has been argued, led to the debt-deflation crisis in 1932–1933 (Friedman and Schwartz 1963, Timberlake 1993). Likewise, Miron (1986, 1996) attributes the absence of panics in 1915–1928 to Fed open market prudence in accommodating seasonal demands for loans and currency, while the panics in 1929–1933 is attributed to the Fed's incomplete accommodation of those demands.

in the late 19th century, particularly in October. In view of the figures for the seasonal variation in the Canadian and American note stocks of this period presented by Selgin & White (1994), the smaller Canadian seasonal variation in call loan rates can credibly be attributed to the greater demand-elasticity of the Canadian note stock. Unfortunately, these kinds of market rates do not seem to be readily available for Sweden. What is available is the official loan rates of the banks. These are reported monthly and are included in the Summary Reports. However, they tended to be fairly stable over the year, and did not exhibit seasonal variation. From the 1880s they also followed the discount rate of the Bank of Sweden (Brisman 1931, p. 187). A small seasonal variation in the official loan rates therefore does not necessarily indicate a demand-elastic note supply.[8]

A "third best" way is to measure the quantitative change in the note stock. As shown in Hortlund (2005, Essay 5 of this volume), the note stock varied seasonally with the known (qualitative) demands of agriculture and industry. It is plausible to assume that these demands did not greatly alter in the few years after note monopolisation in 1901–1904. Reasonably, if the seasonal quantitative elasticity of the note stock *decreased* after monopolisation, then this should indicate that the note stock became *less* demand-elastic, and hence that the law of reflux and/or central bank prudence is inferior to the clearing mechanism of unrestricted note banking. What if the quantitative elasticity were to *increase* after monopolisation? Should this be interpreted as greater demand-elasticity, or perhaps as excessive elasticity – the note stock overshoots and fluctuates more than what is dictated by demand? Without knowledge of demand, this question is not possible to answer. It may however be argued that "excess

[8] On the other hand, Brisman (1931, p. 188) claims that the discount rate in the 1880s fluctuated less in Sweden than it did in England and Germany. Whereas the Swedish discount rate was changed on average one time per year in the 1880s, it changed on average 6 ½ times per year in England, and 3 times per year in Germany. This fact could be interpreted as greater stability and demand-elasticity of the Swedish note banking system, compared to the note-monopolistic ones of England and Germany.

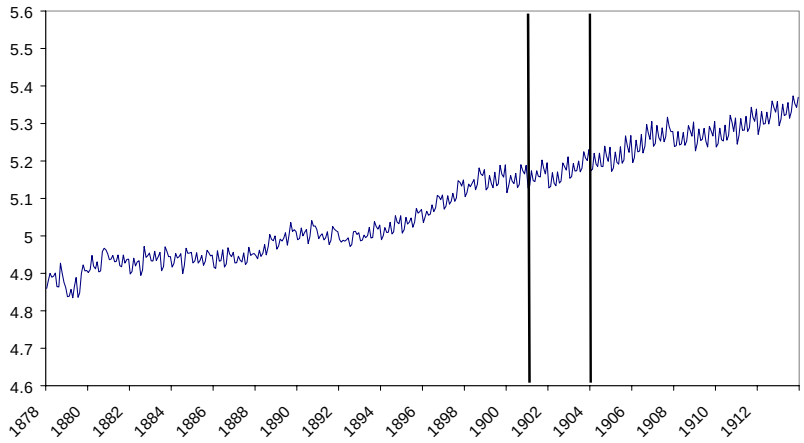
elasticity" would not be harmful if the note stock became as excessively downward elastic as it became excessively upward elastic. For this reason, the liability elasticity test is perhaps the most important test, which shows whether the law of reflux and/or central bank prudence were as efficient at mopping up excess liquidity as was the clearing mechanism.

It may also be pointed out that the tests can falsify but not confirm the efficiency of the Law of Reflux, since greater elasticity after monopolisation could be due to other causes. Prudence has already been mentioned – greater elasticity may be explained by the Bank of Sweden becoming more professional in its operations around the time of monopolisation. Before, the organisation was more bureaucratic in its decisions, with little regard for market-conforming policies (Brisman 1931). Also, the banking system became more organised at the turn of the 20th century. Banks had more branches, and deposits grew in importance – people would deposit cash balances rather than holding on to them.

2.3 The data

Data are from the Summary of the Bank Reports (*Sammandrag af bankernas uppgifter*). These were monthly balance statements that all commercial banks were required to report to the Bank Supervisory Authority (*Bankinspektionen*). Figure 1 shows the logged total note stock of the Swedish banking system (Bank of Sweden and Enskilda bank notes), 1878–1913.

Figure 1 Log of the Swedish note stock, 1878–1913.

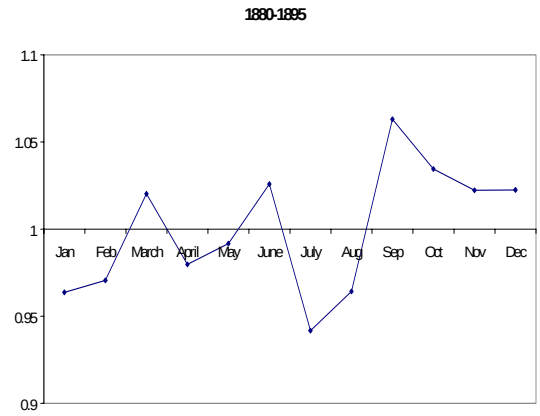


Source: Summary of the Bank Reports.
Note: Monopolisation occurred in 1901–1904.

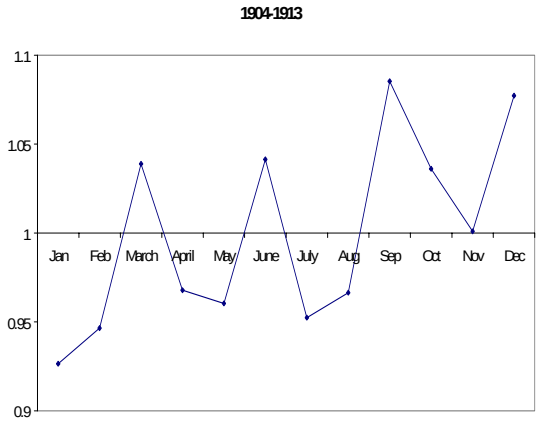
Monopolisation did not radically alter the behaviour of the note stock. Its path seems continuous with regard to trend, cycle and season. If anything, Figure 1 suggests that the note stock may have become more elastic around the time of monopolisation. This is supported by Figure 2, which shows seasonal averages of the total note stock for the years 1880–1895 and 1904–1913, respectively.[9] Seasonal averages have been calculated by means of maximum likelihood on the differenced logged note stock, with monthly dummies and four lags in the disturbance term. Seasonal averages have been normalised to express a month's circulation as a ratio of the average (monthly) annual circulation. Specification is provided in the Appendix. Regression results are available on request.

[9] More precisely, from January 1880 to January 1896, and from January 1904 to January 1914.

Figure 2 Average monthly note stocks, 1880–1895 and 1904–1913.



	Δ	*p*
Jan	–0.059	0.000
Feb	0.007	0.24
Mar	0.050	0.000
Apr	–0.040	0.000
May	0.012	0.030
Jun	0.034	0.000
Jul	–0.084	0.000
Aug	0.023	0.000
Sep	0.099	0.000
Oct	–0.029	0.000
Nov	–0.012	0.13
Dec	0.000	0.77



	Δ	*p*
Jan	–0.16	0.000
Feb	0.020	0.001
Mar	0.092	0.000
Apr	–0.071	0.000
May	–0.007	0.58
Jun	0.081	0.000
Jul	–0.089	0.000
Aug	0.014	0.002
Sep	0.12	0.000
Oct	–0.049	0.000
Nov	–0.035	0.000
Dec	0.076	0.000

Source: Summary of the Bank Reports.

Figure 2 strongly suggests that notes became more elastic after monopolisation. The note stock expanded more in the expansion months (March, June, September and December) in 1904–1913 than it did in 1880–1895. It also contracted percentually more in the contraction months (January, April, July, October–November). This indicates that the note stock became both more upward and downward elastic after monopolisation. This is formally tested next.

2.4 *t*-tests

The means of the monthly changes in the periods 1880–1895 and 1904–1915 are compared by way of *t*-tests. Monthly changes are expressed as the difference in the logged note stock. Upward elasticity is tested in the months of expansion (March, June, September and December). Likewise, downward elasticity is tested in the months of contraction (April, July, October and January). In the same way, it is investigated whether the demand liabilities of the Bank of Sweden became less elastic.

Upward elasticity

Table 1 confirms that the note stock actually became more upward elastic after note monopolisation.

Table 1 *t*-test of upward elasticity.

			Δ Log Notes		
		Obs.	*Mean*	*S. D.*	*p*
March	1880–95	16	0.053	0.027	
	1904–13	10	0.097	0.0080	
	Difference		0.044		0.0000
June	1880–95	16	0.036	0.018	
	1904–13	10	0.083	0.014	
	Difference		0.047		0.0000
September	1880–95	16	0.095	0.021	
	1904–13	10	0.12	0.017	
	Difference		0.025		0.0036
December	1880–95	16	0.0079	0.019	
	1904–13	10	0.077	0.030	
	Difference		0.069		0.0000

Note: *p*-values for two-sided test of zero difference.

In the months of expansion, the difference in means is positive in every month. The difference is largest in December, and smallest in September. The difference is statistically significant at the one percent level for all four months.

Downward elasticity

The note stock also became more downward elastic after monopolisation, as Table 2 shows.

Table 2 *t*-test of downward elasticity.

			Δ Log Notes		
		Obs.	*Mean*	*S. D.*	*p*
April	1880–95	16	–0.039	0.019	
	1904–13	10	–0.072	0.0054	
	Difference		–0.033		0.0000
July	1880–95	16	–0.078	0.021	
	1904–13	10	–0.090	0.012	
	Difference		–0.012		0.088
October	1880–95	16	–0.031	0.022	
	1904–13	10	–0.049	0.013	
	Difference		–0.018		0.013
January	1880–95	17	–0.061	0.026	
	1904–13	11	–0.15	0.023	
	Difference		–0.087		0.0000

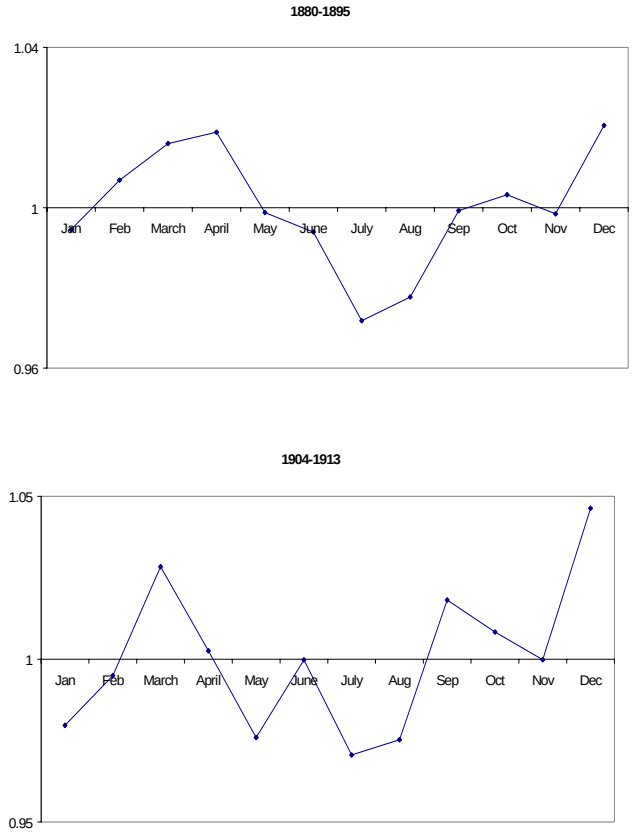
Note: *p*-values for two-sided test of zero difference.

The difference in means is negative for all four months. The difference is largest in January, and smallest in July. The difference is significant at the one percent level in every month except July.

Liability inelasticity

Figure 3 shows the seasonal variation in the demand liabilities of the Bank of Sweden, 1880–1895 and 1904–1913. Demand liabilities are defined as the sum of the notes and the folio account (from 1904 called the giro account). Seasonal averages have been calculated in the same way as with notes.

Figure 3 Seasonal variation in demand liabilities of the Bank of Sweden, 1880–1895 and 1904–1914.



Source: Summary of the Bank Reports.

Figure 3 strongly suggests that demand liabilities of the Bank of Sweden did *not* become less elastic after monopolisation. Most conspicuous are the months of March–April and September–October. Before monopolisation, aggregate demand liabilities actually *increased* in April and October, when the note stock decreased. This suggests that notes were deposited with the Bank of Sweden, swelling the folio account, instead of being redeemed. That liability elasticity actually increased after monopolisation is confirmed by Table 3, which shows test results for upward and downward elasticity.

Table 3 *t*-tests of upward and downward elasticity: change in the log of Bank of Sweden demand liabilities, 1880–1895 and 1904–1913.

Upward elasticity					
		Obs.	*Mean*	*S. D.*	*p*
March	1880–95	16	0.034	0.060	
	1904–13	10	0.092	0.032	
	Difference		0.059		0.0036
June	1880–95	16	–0.021	0.039	
	1904–13	10	0.061	0.031	
	Difference		0.082		0.0000
September	1880–95	16	0.044	0.029	
	1904–13	10	0.094	0.017	
	Difference		0.050		0.0000
December	1880–95	16	0.059	0.035	
	1904–13	10	0.12	0.037	
	Difference		0.061		0.0005
Downward elasticity					
		Obs.	*Mean*	*S. D.*	*p*
April	1880–95	16	0.0097	0.048	
	1904–13	10	–0.055	0.011	
	Difference		–0.064		0.0001
July	1880–95	16	–0.034	0.040	
	1904–13	10	–0.071	0.022	
	Difference		–0.038		0.0053
October	1880–95	16	0.0042	0.042	
	1904–13	10	–0.019	0.011	
	Difference		–0.023		0.051
Jan	1880–95	17	–0.050	0.042	
	1904–13	11	–0.17	0.021	
	Difference		–0.12		0.0000

Source: Summary of the Bank Reports.

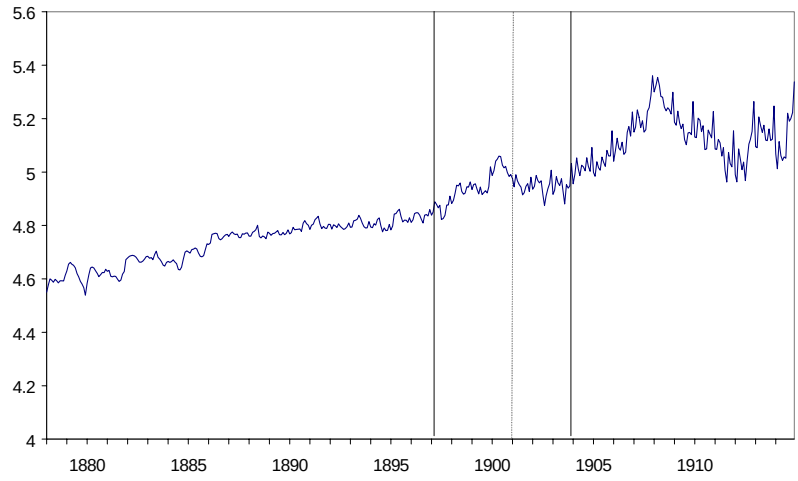
Table 3 confirms that demand liabilities became more upward elastic in the expansionary months. The difference in elasticity is positive and statistically significant at the 1 percent level. Demand liabilities

also became more downward elastic. The difference is negative in all contraction months. It may be noted that demand liabilities actually increased in April and in October, in 1880–1895.

3 Discounted bills and loans of the Bank of Sweden, 1878–1914

The Bank of Sweden allowed the commercial banks to borrow in two ways: by rediscounting bills and by extending bond-secured loans. Since the Bank of Sweden's policy after 1905 was to rediscount only commodity bills with less than 45 days of maturity, it would be interesting to see whether any difference in the demand-elasticity of the two assets can be detected. According to the real bills doctrine, commodity bills should be more closely correlated with the "needs of trade" for payments media, than should other forms of credit. This is because the paying merchant would later resell the commodities and hence redeem the bill. Commodity bills were therefore thought to be self-liquidating. Although the doctrine has been influential among bankers (Thunholm 1962, p. 88), and also been a guiding principle of monetary policy, it has been branded a fallacy by economists (Mints 1945, p. 25, Humphrey 1986, Timberlake 1993, p. 259). Figure 4 shows the log of the sum of bills and loans, 1878–1914.

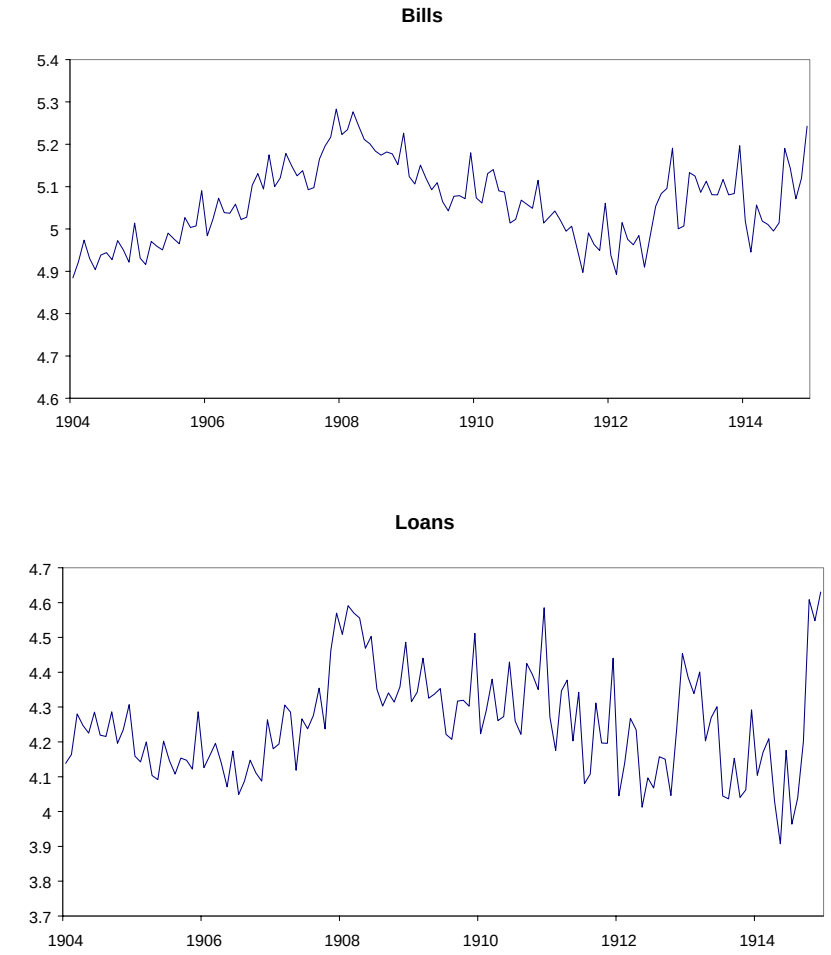
Figure 4 Log of loans and bills of the Bank of Sweden, 1878–1914.



Source: Summary of the Bank Reports.

The aggregate volume of bills and loans exhibit a clear structural break at the time of the new bank law in 1897. Before that time, there was little cyclical or seasonal movement. Bills and loans became much more cyclical and seasonal after monopolisation in 1904. Was the Bank of Sweden's volume of bills more closely correlated with the seasonal fluctuations in notes and demand liabilities, than was the volume of loans? Figure 5 provides "close-ups" of bills and loans presented separately, for the period 1904–1914.

Figure 5 Log of bills and log of loans of the Bank of Sweden, 1904–1914.



Source: Summary of the Bank Reports.

Both bills and loans exhibit clear seasonal movements that seem to correlate highly with the movements in payments media. To test which one was the strongest co-mover, I compare the correlations of the differenced logs of bills and loans with those of notes and demand liabilities. Table 4 presents correlations and also partial correlations for the periods 1880–1895 and 1904–1913.[10]

[10] Partial correlations attempts to estimate the correlation between two variables if the other variables are held constant. See Greene (2000, p. 233).

Table 4 Correlations of differenced logs of notes, demand liabilities, bills and loans of the Bank of Sweden, 1880–1895 and 1904–1913.

		Correlations		Partial correlations	
		Bills	Loans	Bills	Loans
1880–1895	Notes	0.28	0.39	0.19	0.33
	Liabilities	0.33	0.28	0.26	0.21
1904–1913	Notes	0.80	0.75	0.58	0.44
	Liabilities	0.87	0.78	0.73	0.46

Source: Summary of the Bank Reports.
Note: All coefficients are significant at the 1 percent level.

As expected, correlations were lower in 1880–1895 than they were after monopolisation. Loans were then actually more correlated with the note stock, than were bills. The period 1904–1913 is more interesting, since the Bank of Sweden then pursued monetary policy in accordance with the real bills doctrine. Indeed, in this period bills were more correlated with both notes and demand liabilities than were loans. Loans were more correlated with notes in 1880–1895, when the Bank of Sweden did not restrict discounting to commodity bills of short maturity. But in 1904–1913, when this was the case, bills moved more closely with the "needs of trade" for payments media, than did bond-secured loans. This result may be interpreted as support to the view of the Banking School and the real bills doctrine.

4 Conclusions

This paper compared the elastic properties of the Swedish note stock before and after notes were monopolised by the Bank of Sweden in 1901–1904, in light of the doctrines expounded by the classical schools of monetary thought. The investigation warrants the following conclusions.

1. The note stock did not become less elastic after monopolisation. Data show that note supply became more upward elastic in the expansion months of March, June, September and December, as well

as more downward elastic in the contraction months of April, July, October and January.

2. Neither did the demand liabilities of the Bank of Sweden become less elastic. Before monopolisation, demand liabilities actually increased in the contractionary months of April and October. This suggests that Bank of Sweden notes were deposited rather than redeemed in this period. Demand liabilities became more elastic after monopolisation.

3. In addition, when the Bank of Sweden acted in accordance with the real bills doctrine and only discounted commodity bills of short maturity in 1904–1913, bills varied more closely with the volumes of notes and demand liabilities. This suggests that real bills are more correlated with the "needs of trade" for payment media, compared to other forms of credit.

In sum, results seem more conducive to the views of the Banking School, than to those of the Free Banking School. The withdrawal of notes from the interbank clearing mechanism did not have the detrimental effects on elasticity that might be conjectured from the thinking of the Free Banking School. All of the principles of the Banking School – the law of reflux, needs of trade, the real bills doctrine – find support in the Swedish data.

It was mentioned that the development could be due to other causes than to the general efficiency of the Law of Reflux. To see whether the Swedish development was a general phenomenon or peculiar to it, it would be worthwhile to compare the development of elasticity in countries with and without note monopoly over the whole period of the classical gold standard. For the moment, the Banking School has the upper hand.

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Appendix

Specification of regressions and calculations of seasonal components for notes and demand liabilities.

The following model was estimated:

$$\Delta \, Log\ Notes = \beta_0 Jan + \beta_2 Feb + ... + \beta_{11} Dec + u \, , \qquad \text{(A1)}$$

where

$$u_t = u_{t-1} + u_{t-2} + u_{t-3} + u_{t-4} + \varepsilon_t \, . \qquad \text{(A2)}$$

A value for each month v_i was then calculated as

$$\begin{aligned} v_0 &= 1 \\ v_i &= 1 + \beta_i + \frac{1}{12} \sum_0^{11} \beta_j \end{aligned} \quad . \qquad \text{(A3)}$$

The seasonal component s_i was then calculated as

$$s_i = 1 + v_i - \frac{1}{12} \sum_0^{11} v_j \qquad \text{(A4)}$$